

Interdisciplinary Treatment of Diabetes Mellitus in a Military Treatment Facility

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The American Diabetes Association emphasizes interdisciplinary management as the standard of care for patients with diabetes. Many times, however, interdisciplinary means various health care professionals treating a patient but not necessarily interacting with each other regarding the patient's care. Recently, Tripler Army Medical Center replicated the Joslin Diabetes Center's diabetes outpatient intensive treatment program as part of a Joslin Diabetes Center/Department of Defense/Veteran's Administration research collaboration. Tripler Army Medical Center named this interdisciplinary program *Holopono*, which is Hawaiian for success. *Holopono* is a team of health care professionals providing integrated care and education to a group of diabetes patients over 3.5 days. Individual care management, aided by an Internet-based telemedicine system, then continues for 1 year after entry into the program. This article describes the *Holopono* program, the role of each team member, and how the team functions together to provide comprehensive diabetes care.

Introduction

Diabetes mellitus affects 16 million Americans, many of whom are Department of Defense health care beneficiaries. The diabetes incidence rates for the military community are similar to civilian rates, and the prevalence rates for Veterans Administration (VA) medical beneficiaries are higher than national rates.^{1,2} Diabetes-related health care costs are a significant portion of the medical expenditures for each system.

Diabetes is a chronic illness requiring patient education, motivation, and adherence for successful management. The nature of the disease necessitates close support from a variety of health care providers. The American Diabetes Association's (ADA) standard of medical care recommends that diabetes treatment be delivered via a health care team minimally consisting of a physician, nurse, dietitian, and mental health professional.³ Although health care professionals may interact regarding certain diabetes patients, this interaction may not necessarily constitute an integrated team approach.

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Program Overview

As part of the Joslin Diabetes Center/Department of Defense/VA diabetes research project, an interdisciplinary diabetes treatment team has been created at Tripler Army Medical Center (TAMC) to implement a biopsychosocial diabetes immersion program. The team consists of an endocrinologist, several internists, nurses, dietitians, an exercise physiologist, a health psychologist, and a pharmacist, with retinal evaluation provided using the Joslin Vision Network, the telemedicine initiative of the Joslin Diabetes Center (Boston, Massachusetts). This article describes the diabetes treatment program, the role of each team member, and how the team functions together to provide comprehensive diabetes care.

The TAMC diabetes treatment program, or *Holopono*, which is Hawaiian for success, is a replication of the Joslin Diabetes Center's Diabetes Outpatient Intensive Treatment program. This is a 3.5-day diabetes treatment and education program to improve the self-management and medical care of diabetes patients. The diabetes treatment involves medical evaluation and management changes when indicated, sometimes significantly altering the medication regimen. The training consists of diabetes education classes and real-time observation and demonstration of diabetes self-care skills. The goal of the program is to develop a comprehensive, individual diabetes management plan for each patient that will result in lower glycosylated hemoglobin and blood glucose levels.

The first day of the program consists of a series of individual assessments, one group session, and team rounds. Each team member, except for the health psychologist, conducts an individual assessment of the participants. The physician intake lasts up to 45 minutes, and the other health care providers typically spend 20 minutes interviewing the patients. The health psychologist leads a participant group meeting, after which the health care team meets for rounds. During rounds, team members provide feedback on each participant and assist in creating a treatment plan and focus of intervention for each patient. The other 3 days of the program begin with team rounds to update the progress and status of each participant. After rounds, team members alternate presenting diabetes education and self-management classes within their specialties (Table I). The topics and specific content of the classes are discussed below in terms of each specialty's role in the project. The overall approach by team members emphasizes patient confidence, hope, empowerment, clarity of self-care plan, and diabetes knowledge.

At the conclusion of the program, a treatment summary letter is sent to the participant's primary care manager based on each team member's final recommendation. A case manager maintains contact with the participants for 1 year to assist with

TABLE I
HOLOPONO DIABETES PROGRAM SCHEDULE

Time	Day 2	Day 3	Day 4
7:30-8:00 a.m.	Blood glucose testing	Blood glucose testing	Blood glucose testing
8:00-9:00 a.m.	Breakfast/team rounds	Breakfast/team rounds	Breakfast/team rounds
9:00-10:00 a.m.	Diabetes know how	Exercise education	Making healthy food choices
10:00-10:45 a.m.	Healthy eating habits	Blood glucose monitoring	Understanding diabetes medications
10:45-11:00 a.m.	Break, blood glucose testing	Break, blood glucose testing	Break, blood glucose testing
11:00-11:45 a.m.	Foot care	Sick day management	Hypoglycemia management
11:45 a.m.-12:45 p.m.	Lunch	Lunch	Lunch
12:45-1:00 p.m.	Blood glucose testing, move to exercise room	Blood glucose testing, move to exercise room	Blood glucose testing
1:00-2:00 p.m.	Exercise	Exercise	Bringing it all together (self-care plan finalized)
2:00-2:30 p.m.	Blood glucose testing/wrap-up	Blood glucose testing/wrap-up	Final wrap-up/graduation

adherence to the self-management plan. The case manager also coordinates with the endocrinologist and primary care managers when alterations in diabetes medication regimens are suggested.

The case management process is aided by an Internet-based telemedicine system. As part of the Pacific Regional Project Office telemedicine initiative at TAMC, *Holopono* uses a secure, interactive World Wide Web site with a relational database. Diabetes education modules are accessible on the program's World Wide Web site, and patients e-mail team members their questions and concerns regarding their health status, meal plan, exercise, or any other diabetes-related issues. *Holopono* participants also provide recent blood glucose results via the Internet to the case manager, who is able to reply with recommendations for behavioral changes regarding their meal plan and exercise or request laboratory tests. The case manager is able to provide feedback on each patient's laboratory results via the Internet as well.

Team Members

Patients

The patients are active participants in the medical and behavioral treatment planning. To improve adherence, changes that they are willing and able to make are primarily emphasized. Participants contribute information regarding their present lifestyle and areas of their self-care regimen that they feel are strengths and weaknesses. Realistic recommendations for future self-care behaviors can then be made by team members with options on how patients may incorporate them into their daily living. Participants also assist with assessing the success of medication and lifestyle changes by completing food intake and blood glucose logs each day of the program and by providing direct feedback to the team members regarding physical and emotional status. Other patients provide vital social support for each other by socializing during breaks and meals.

Physician

The physician provides the clinical direction for the team management of the patient's diabetes and other medical prob-

lems. Unlike the traditional solo physician approach, close interaction with the rest of the team produces more information, insight, and ideas that can lead to better management options for each patient's individual needs.

A thorough history and physical examination is performed on evaluation day, with a focus on diabetes and its end-organ effects. The identified medical issues lead to formal consultation requests and focus the multidisciplinary team effort in the management of diabetes. Initiation and changes of pharmaceutical therapy are proposed and monitored by the physician.

After rounds each morning, the physician reviews daily with each patient any laboratory results and summarizes the treatment plan, medication, and monitoring needs for that patient. The physician also coordinates the further individualized educational needs for each patient.

Diabetes Nurse Educator

The diabetes nurse educator role in *Holopono* is key to maintaining close connection between the team and the participants. A nurse is present during the entire program for any patient concerns or questions and to coordinate staff activities. During the initial individual assessment and throughout the following 3 days, the diabetes nurse educator assesses each participant's diabetes management skills and diabetes knowledge. The nurse observes all blood glucose monitoring and insulin injections during the program and is available for feedback and suggestions on improving these skills. Patients monitor their blood sugar at least four times each day while at the program, then at least once during the evening. During the morning blood glucose monitoring, the nurse coordinates the calibration of the patient's glucometer with TAMC's laboratory glucometer.

The diabetes nurse teaches more classes than any other team member. Four diabetes education classes are led by the nurse, including general diabetes knowledge, acute complications and response to hypoglycemia, monitoring and managing blood glucose, and reducing the risk of long-term complications. The nurse also provides informal group instruction on how to monitor blood glucose and manage the varieties of insulin regimens within the group. Mixing, drawing, and injecting insulin are topics the nurse covers with participants on an as-needed basis.

Dietitian

Dietitian involvement is vital to effective diabetes management. Dietary practices are a key component in effective blood glucose control.⁴⁻⁶ On the first day of the program, the dietitian interviews each patient and completes a nutrition assessment, which includes information on the patient's diet history, previous diet education, weight history, lifestyle, social situation, and nutrition needs/goals. During team rounds, the dietitian provides feedback about the patient's nutrition needs and lifestyle. The dietitian subsequently develops individual meal plans for each patient based on the nutrition assessment and information gathered by the other team members.

On the second day of the program, the dietitian presents a meal-planning class that covers general dietary guidelines, the food guide pyramid, and the roles of carbohydrate, protein, and fat in the diet. Participants receive an individual meal plan based on the exchange system. Emphasis is placed on the number of carbohydrate servings per meal and snack. The exchange lists are reviewed in detail, and food models are used to demonstrate appropriate serving sizes. Patients are asked to create two sample menus using their meal plans, which the dietitian reviews with the participant during the week. The dietitian also presents a class on reading food labels, grocery shopping, and dining out.

Breakfast, lunch, and snacks are provided for the patients and their guests in the program. The dietitian oversees the menus and provides on-site guidance during the meals. The meals are buffet style, which encourages patients to make appropriate food choices and self-manage their diabetes.

During the week, patients keep daily food records in their logbooks, which the dietitian reviews during morning team rounds and discusses with the team. Positive feedback and dietary suggestions are given to individual patients during the day to encourage them to continue making positive dietary changes. Participants are encouraged to share concerns with their meal plans, and adjustments are made as needed.

Exercise Physiologist

The role of exercise in the control of diabetes has become increasingly recognized in the past two decades as many studies have reported improved glucose tolerance and increased insulin sensitivity resulting from physical activity.⁷⁻¹⁰ Persons with diabetes are also known to be at increased risk for cardiovascular disease, which may be reduced by exercise training.^{11,12} Despite the documented benefits of exercise, one recent study has reported that more than 50% of older persons with type 2 diabetes reported no weekly physical activity.¹³

The exercise component of *Holopono* provides the participants information about the importance of physical activity in their diabetes management program. The exercise physiologist's involvement in the program consists of an initial exercise assessment, conducting two 1-hour exercise sessions, leading a 45-minute class on exercise and diabetes, participating in daily team rounds, and preparing an individualized recommended home exercise plan.

The initial exercise assessment focuses on the participant's present type and level of physical activity and evaluates the availability of exercise equipment and facilities, occupational and recreational activity if any, past participation in sports or

exercise activities, and any exercise limitations. The mode, duration, intensity, and frequency of each type of current exercise activity are carefully determined during the interview and used as a basis for the activity prescription during the two exercise sessions and the home exercise plan.

The exercise sessions have several purposes: (1) demonstrate the effect of exercise on blood glucose level, which is measured before and after the exercise session; (2) document the current exercise intensity if the participant is exercising using treadmill and cycle ergometry; and (3) determine heart rate response to known exercise workloads. Based on the initial assessment, an exercise plan is developed before the first exercise session. It includes the type of exercise, intensity, and duration of activity.

Before each exercise session, participants have initial blood pressure, heart rate, and blood glucose measurements taken. They wear electronic heart rate monitors during the session to allow easy determination of exercise intensity response. Each person is taught to use a scale for rating perceived exertion to assist in reproducing the exercise intensity at home. Depending on age, recent level of activity, and other limitations, the duration ranges from 30 to 40 minutes of actual exercise.

Based on the information obtained during the initial exercise assessment and the exercise sessions, the exercise physiologist develops a home exercise plan for each individual. The plan takes into consideration each participant's age, physical limitations, available equipment and resources, and individual preferences. Recommendations of frequency, intensity, and duration of activity sessions are included in the exercise plan.

Health Psychologist

The role of the mental health professional in diabetes management has grown in conjunction with mounting evidence of the importance of behavioral and psychosocial aspects of the disease.¹⁴ The American Diabetes Association reinforces this importance by recommending that mental health professionals be included in the standard care of diabetes patients. The health psychologist's role in *Holopono* is to assist patients with self-management plans, reinforce and foster social support among participants, and build the cohesion of group and team members. The overall goal of the health psychologist's intervention is to improve adherence and to decrease barriers to self-care.

The psychologist leads the first group meeting, which occurs after the individual assessments on the first day, so the participants may interact with one another and develop rapport. The interdisciplinary philosophy of the program is instilled and reinforced during this 45- to 60-minute session. Relevant information gathered during this initial meeting includes the participant's struggles with diabetes, overall mood, coping strategies, and potential psychosocial barriers to self-care. The psychologist also teaches the last class of the program, which is focused on setting realistic, sustainable self-care goals and increasing motivation to apply the self-care plan to everyday life. Specific realistic plans for self blood glucose monitoring, exercise, and meals for the next week are created.

Individual consultation is provided as needed by the psychologist for particular behavior changes relating to participants' self-management plans and for more traditional mental health concerns such as depression. Specific issues related to diabetes that affect patient self-care, such as fear of hypoglycemia, diabetes-related distress, weight management, disordered eating,

and needle phobias, are also addressed individually on an as-needed basis by the psychologist.

Pharmacist

Including a pharmacist in the *Holopono* team has been extremely valuable because of the frequently complex nature of participants' medication regimens. The pharmacist reviews prescribed and alternative medications for each patient during assessment day. He or she assists the physician in checking the medication schedule, adherence, contraindications, interaction effects, and treatment options. The pharmacist also conducts a class on diabetic medications that specifically covers what the medications are designed to accomplish, their potential side effects, types and actions of insulin, injection sites, and various medication schedules.

Joslin Vision Network

The Joslin Vision Network (JVN) is the telemedicine component of the Diabetes Eye Health Care Model of the Beetham Eye Institute of the Joslin Diabetes Center. Briefly, the JVN includes a nonmydriatic fundus camera for retinal image acquisition, with connectivity to a coordinating and reading center at the Joslin Diabetes Center in Boston, where retinal images are transmitted and graded for level of diabetic retinopathy by certified graders. Determining the level of retinopathy allows for appropriate follow-up evaluation for diabetic retinopathy and the generation of a written and electronic report for the referring health care provider.

Patients enrolled in *Holopono* receive a letter 1 week before their scheduled program explaining the JVN imaging procedure. Retinal imaging without pupil dilation is performed on the morning of the assessment day or early on the morning of the second day. Retinal images are stored and transmitted via the Internet to the reading and coordinating center in Boston. A report of retinal findings and level of diabetic retinopathy is returned to the JVN coordinator at TAMC. Copies of the letter are given to the patient and the primary care provider, and one copy is filed in the *Holopono* folder. The JVN coordinator reviews the findings individually with the patients, and a comprehensive eye examination is scheduled at the TAMC ophthalmology department if the findings suggest the need for an examination within 1 month. For patients not requiring prompt eye examination, appropriate follow-up is discussed with the patient.

Preliminary Results

Demographic and physical characteristics of the *Holopono* participants with preliminary measures completed are reported in Table II. A paired-samples *t* test was conducted to compare hemoglobin A1c (HbA_{1c}) results at baseline and 6 months after individuals attended a *Holopono* group. Participants' average HbA_{1c} before entering the program was 9.9%. Six months after entering the program, the average HbA_{1c} was significantly lower (8.2%, $p < 0.001$) (Table III). Average lipid levels were also collected, and although total cholesterol, high-density lipoprotein, and low-density lipoprotein tended to improve over 6 months, the changes were not statistically significant (Table III).

TABLE II

DEMOGRAPHIC CHARACTERISTICS OF HOLOPONO PARTICIPANTS
(*N* = 48)

Age (years)	50.8
Sex (% Female)	33.3
Ethnicity (%)	
African American	18.5
Asian American	25.9
White	22.2
Hispanic	7.4
Pacific Islander	25.9
Marital status (%)	
Married	79.6
Divorced	5.6
Single	5.6
Widowed	1.9
Military status (%)	
Active duty	18.5
Family member	33.3
Retiree	35.2
VA beneficiary	13

TABLE III

SIX-MONTH HEMOGLOBIN A1C AND LIPID LEVELS

Test	Baseline	3 Months	6 Months
Hemoglobin A1c (% of blood)	9.9	8.3 ^a	8.2 ^a
Cholesterol (mg/dL)	200.4	188	197.8
High-density lipoprotein (mg/dL)	53.4	54.9	55.1
Low-density lipoprotein (mg/dL)	112.8	106.8	109.9

^a $p < 0.001$.

Discussion

Holopono offers an interdisciplinary and comprehensive treatment of diabetes that may be suitable for other military health care facilities. This program takes advantage of the expertise of a variety of health care professionals to improve the care of a chronic disease whose course is highly dependent on patient adherence. Diabetes skills are taught and observed, and each patient's regimen is demonstrated as effective over the course of the 3 days of the program.

Program staffing is perhaps the most important factor in implementing such an intervention. A key factor is the availability of staff members who are interested and knowledgeable in diabetes care. The personal characteristics of team members are also important to ensure successful interventions and close teamwork. Team members must be comfortable interacting in a group setting and leading classes, because many of the interventions are group based. Team members also need to be able to provide concise, constructive feedback to other team members and patients and to be consistent with team decisions.

Incorporating a flexible program design allows for altering participation of some health specialists and/or the adding other health care professionals not mentioned above. There are *Holopono* classes taught by health care professionals who do not participate in the assessment or treatment of group members. These include classes on foot care presented by a podiatrist and

on the meaning and importance of common laboratory tests used in assessing diabetes presented by a chemist from the laboratory.

Holopono is not a replacement for existing diabetes education programs or diabetes medical management. Not every diabetes patient needs or is appropriate for such an intensive program. *Holopono* targets patients whose HbA_{1c} is increased, who can speak English, who perform low-intensity exercise, and who are available to come to the hospital 4 days in a row. *Holopono* has been in place since December 1998, with plans to continue at TAMC beyond the expected duration of the research protocol. The long-range goal is to incorporate the *Holopono* team into the standard treatment options for all TAMC patients with diabetes.

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